

Prevention of chronic disease, services for long-term patients, and social programs related to their health were discussed at a recent meeting held by directors of State chronic disease programs and the Subcommittee on Long-Term Illnesses and Aging of the Association of State and Territorial Health Officers at the University of Michigan, Ann Arbor. Of the 20 papers delivered, 4 have been selected for publication here in slightly revised form.

Progress in Control of Chronic Disease

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THE MEDICAL profession's awareness of the preventive aspects of chronic illness is just coming of age. Much has already been written and said about this subject; many committees and public health agencies have pressed home salient points; and the current state of our knowledge in the field has been treated comprehensively in the volume, *Prevention of Chronic Illness*, issued in 1957 by the Commission on Chronic Illness. The impetus of past efforts now finds expression in the general acceptance of the belief that chronic disease represents the most important problem facing medicine today and in major breakthroughs in the primary or secondary prevention of certain long-term diseases. (In primary prevention, the occurrence of a disease is averted; in secondary prevention, the progression of a disease from its early, unrecognized stage to a more severe stage is halted.)

In discussing chronic diseases with physicians and medical students we find there is a common tendency to consider as chronic only

those long-term diseases not yet subject to specific treatment or to primary or secondary prevention. This attitude naturally fosters a pessimistic outlook.

Man's memory can be short and the physician is not exempt from this frailty. In the field of acute diseases, our students have to be reminded that in New York City alone there were 166 deaths from yellow fever in 1822, 5,071 deaths from cholera in 1849, and 552 deaths from typhoid fever in 1911.

The physician's memory of the advances in prevention and control of some long-term illnesses is beclouded and often dominated by our present inadequacies rather than by our past accomplishments. Unwittingly, he gives too little thought to the chronic diseases which are now preventable or controllable. These diseases represent scientific battles already won even though the strategy and tactics of the clinician and the public health officer are still required to implement the measures for their control.

Just what are these diseases? In 1949, my associates and I compiled a list of representative chronic diseases that were largely controllable, partially controllable, or uncontrollable (see table 1).

Some changes in classification might be made at this date, and some additions should be made. For example, retrolental fibroplasia should be added to the largely controllable group; dental

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caries, paralytic poliomyelitis, certain forms of glaucoma, and some instances of the nephrotic syndrome might be added to the partially controllable group.

Clinical findings during the past few years indicate that the malignant phase of primary hypertension may also be added to the list of partially controllable chronic diseases. Low sodium diets, sympathectomy, and, more recently, the antihypertensive drugs have extended the lives of some hypertensive patients. However, data on the influence of these forms of treatment on the uncomplicated phase of primary hypertension are less convincing and at present do not justify its addition to a list of therapeutic successes. Although atherosclerosis appears in the group of uncontrolled chronic diseases, extensive laboratory, epidemiological, and clinical investigations suggest that a breakthrough may not be too far distant.

These advances have occurred in recent years. In my student days, our teachers told us there were no effective methods to control significantly such long-term diseases as diabetes mellitus, pernicious anemia, tuberculosis, any form of congenital heart disease, sprue, cirrhosis of the liver, Addison's disease, or rheumatic fever. That picture has changed and is continuing to change favorably.

These facts seem worthy of reemphasis because of some recent divergent opinions. Although the former Surgeon General of the Pub-

lic Health Service, Dr. Leonard A. Scheele, has expressed the view that the solution of critical problems in chronic disease is much nearer than is generally recognized, his optimism is not shared by all. Dr. Lowell T. Coggshall, for instance, has been quoted as stating that "progress against chronic illness and disability is disappointingly slow."

In our view it has been surprisingly rapid. For example, witness the progress made in the control of heart disease since the turn of the century. The accompanying chart lists the eight chief causes of past and present cardiac disorders. The deflected arrows symbolize increasing control in 6 of the 8 diseases; hypertension and atherosclerosis remain.

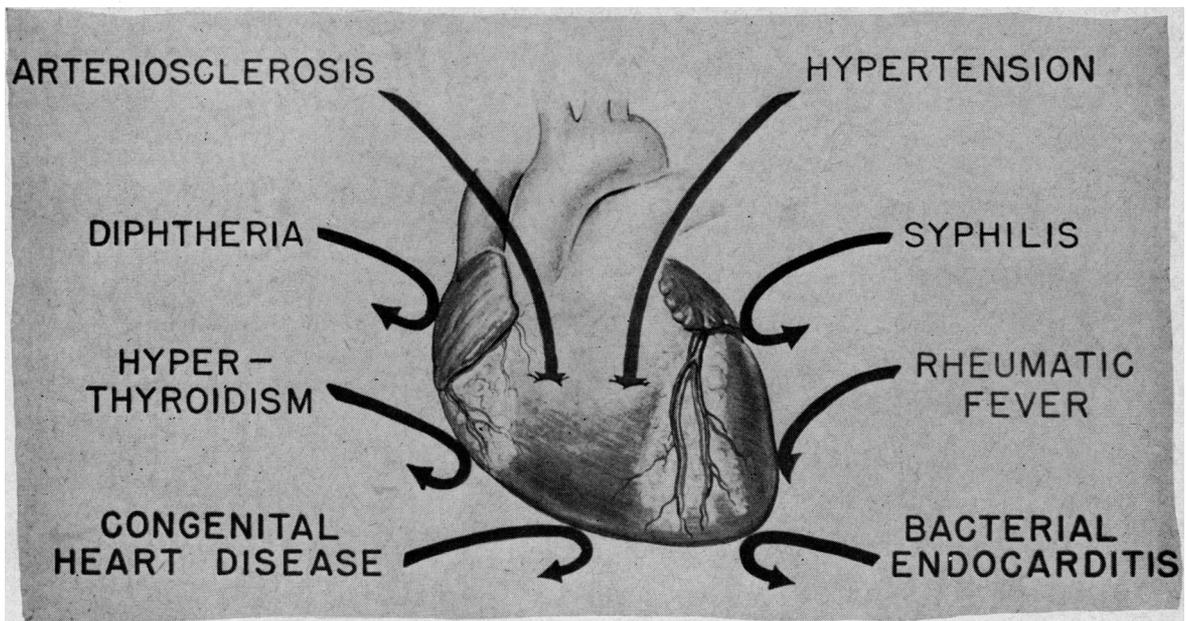
As a fourth-year medical student, I remember seeing a child who was believed to have three disorders of the heart: a congenital lesion which I think was a patent ductus arteriosus, inactive rheumatic heart disease, and *Streptococcus viridans* endocarditis.

I wonder what would have happened if, at that time, I had asked my instructor whether each of these three diseases would be amenable to prevention or control during my lifetime. My guess is that my name would have turned up on the dean's desk with a request for a psychiatric examination.

Another aspect of prevention is the age of onset of many chronic diseases. In the past it was chiefly the "endings" of chronic illness

Table 1. Status of chronic diseases, 1949

Largely controllable	Partially controllable		Largely uncontrollable
Diabetes mellitus	Congenital heart disease	Cretinism	Certain congenital defects
Syphilis	Addison's disease	Diabetes insipidus	Certain neurological diseases
Hyperthyroidism	Certain neuroses and psychoses	Gout	Certain psychoses
Myxedema	Aeromegaly	Coeliac disease	Certain neoplasms
Hyperparathyroidism	Hemophilia	Lung abscess	Chronic glomerular nephritis
Sprue	Bronchiectasis	Hay fever	Hypertension
"Alcoholic" neuritis	Trypanosomiasis	Erythremia	Arteriosclerosis
Pellegra	Tuberculosis	Actinomycesis	
Beriberi	Osteomyelitis	Rheumatic fever	
Scurvy	Rheumatoid arthritis	Asthma	
Rickets	Myasthenia gravis	Myotonia congenita	
Hookworm infestation	Familial periodic paralysis	Epilepsy	
Malaria	General paresis	Bacterial endocarditis	
Amebiasis	Disseminated lupus erythematosus		
Thrombocytopenic purpura			
Familial hemolytic jaundice			
Pernicious anemia			



Progress in the Control of Heart Disease

which attracted the physician's attention and care. Today the "beginnings" of long-term disease are being revealed to the doctor because of painstaking clinical, physiological, biochemical, pathological, and epidemiological studies. This new knowledge must perforce accelerate the rate of development not only of therapeutic but also of preventive measures.

Evidence now indicates the need for reappraisal of the concept that the so-called degenerative diseases of middle life are initiated about the age of 40. The average age of onset and the minimal age of onset of clinical illness (symptoms or signs) for a few of these disorders are shown in table 2. Although organ failure may be generally manifested in middle age, the data support the belief that some chronic illnesses may be recognized in early life.

Table 2. Approximate age of onset of clinical symptoms of some representative chronic diseases

Disease	Average age	Minimal age
Gout.....	40	6
Primary hypertension.....	32	9
Cardiac infarction.....	56	26
Rheumatoid arthritis.....	38	10
Laennec's cirrhosis.....	55	2
Multiple sclerosis.....	28	5

Certainly this belief would apply to those congenital diseases in which genetic factors are obvious. There are a group of diseases in which the hereditary influence is less clearly defined; nevertheless many observers hold that genetic factors play a role in such disorders as hypertension and coronary atherosclerosis, for example.

Be that as it may, recent additions to our knowledge support the opinion that the beginnings of a number of important chronic illnesses of middle and late life can be detected in early life (see table 3).

In some of the entities listed in table 3, it has been established that the early subclinical stage may exist for years prior to the development of overt clinical disease. Screening programs would detect the defect. When possible, preventive measures could then be brought to bear.

For example, the avoidance of obesity has been suggested as a useful primary preventive measure for siblings of diabetic patients. These recommendations are particularly advisable for such individuals when they have decreased glucose tolerance. The efficacy of a restricted carbohydrate diet in such patients to prevent clinical diabetes mellitus is now being explored.

Gamma globulin administration has proved to be a useful measure in preventing recurrent

sepsis in patients with agammaglobulinemia or hypogammaglobulinemia. Early casefinding is necessary if available preventive measures are to be instituted.

Primary prevention is not yet possible for most diseases listed in table 3, but early casefinding will serve as a stimulus for further investigation. Some measures already at hand have not yet been tested adequately. For example, since penicillamine has been reported to be an agent for the removal of copper from patients with Wilson's disease, it might be worth a trial during the precursory phase of hepatolenticular degeneration to prevent increased levels of copper in tissues and thereby possibly influence favorably the course of the disease. Furthermore, it would be of interest to learn the results of long-term probenecid administration in those siblings of patients with gout who have hyperuricemia. Long-term programs have been instituted to study the effect of mild antihypertensive drugs in individuals with a family history of hypertension and who have a hyperreactive arteriolar vascular tree.

The course of action is clear. Disease can be detected in some instances before chronic illness is clinically manifest, and widespread efforts to discover individuals in these subclinical stages of disease are necessary. Progress is being made in the development of measures both for primary prevention of disease and secondary prevention after the disease is evident.

Table 3. Common precursory findings in some representative chronic diseases

Common precursory findings	Clinical disease
Hyperuricemia.....	Gout
Cystinuria.....	Renal calculi
Decreased glucose tolerance...	Diabetes mellitus
Achlorhydria.....	Pernicious anemia
Agammaglobulinemia.....	Recurrent sepsis
Serum iron excess.....	Hemochromatosis
Pernicious anemia.....	Gastric carcinoma
Vascular hyperreactivity.....	Primary hypertension
Prenatal viral infections.....	Congenital anomalies
<i>Streptococcus hemolyticus</i> pharyngitis.	Rheumatic fever
Silicosis.....	Pulmonary emphysema
Intestinal polyposis.....	Carcinoma of the intestine
Cystic fibrosis of the pancreas	Chronic respiratory infection
Heavy cigarette smoking....	Bronchogenic carcinoma

Conclusions

Primary and secondary preventive measures for chronic diseases are being discovered and used with encouraging frequency.

Primary prevention is effective in such representative diseases as syphilis, tuberculosis, malaria, rheumatic fever, pellagra, amebiasis, certain forms of neoplasm, and a wide variety of illnesses associated with industrial agents.

Secondary prevention can be practiced to lessen the delayed pathology and disability which results from, for example, unmanaged or mismanaged syphilis, tuberculosis, rheumatic fever, pellagra, pernicious anemia, diabetes mellitus, and hyperthyroidism.

Epidemiological, clinical, and experimental studies on such matters as the relation of cigarette smoking to lung cancer and the role of dietary fat in human atherosclerosis are now opening possible avenues for prevention not commonly appreciated 20 years ago.

A critical review of existing knowledge indicates that in the great majority of instances the presence of chronic disease long antedates the appearance of clinical illness.

This is obvious in hereditary disorders. For example, hyperuricemia is present years before the appearance of clinical gout, and cystinuria exists long before the development of renal calculosis.

A similar "silent" or "latent" period exists in other long-term disorders (not commonly considered genetically influenced) such as hypercholesterolemia prior to the development of clinical atherosclerosis, heavy smoking before the appearance of bronchogenic carcinoma, pernicious anemia before the development of gastric carcinoma, and serum iron excess prior to the emergence of clinical hemochromatosis.

Although there is a wide range in the years in which chronic illness is first recognized, there is abundant evidence that careful clinical study will disclose the incipient stage of many chronic disorders at a much earlier age than is generally appreciated.

Since preventive measures, if available, exert optimum effects in the early and often reversible phases of chronic disease or illness, it is a matter of high priority to use preventive measures as early as possible.